

# PATENT SPECIFICATION

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## COMPLETE SPECIFICATION

### Improvements in or relating to Detergent Compositions Effective in Removing Radioactive Contamination

We, UNITED KINGDOM ATOMIC ENERGY AUTHORITY, of London, a British Authority, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to detergent compositions and has for object to provide a composition which is effective in removing radioactive contamination from objects and materials.

According to the invention a detergent solution comprises a synthetic surface active agent, a small amount of ethylenediamine tetra-acetic acid, and another polycarboxylic acid in aqueous solution.

Preferred amounts of ethylenediamine tetra-acetic acid and the other polycarboxylic acids are 0.1 per cent and 0.2 to 0.5 per cent respectively, the amount of the latter compound being such as to result in a pH of 1.0 to 2.8 in the solution. The addition of a small amount of sodium carboxymethyl cellulose has been found beneficial. The preferred polycarboxylic acid is oxalic acid which is readily removed from the effluent. Other acids which may be used are citric acid and tartaric acid.

Also in accordance with the invention a composition for preparing a detergent solution comprises a synthetic surface active agent, ethylenediamine tetra-acetic acid and another polycarboxylic acid, the latter two compounds being preferably present in the ratio of one part of the former to from two to five of the latter, and being such that on solution or dilution of the composition with water to form a detergent solution containing substantially 0.1 per cent of ethylenediamine tetra-acetic acid will give rise to a pH of from 1.0 to 2.8.

The synthetic surface active agent may be anionic, or non-ionic for example an alkyl sulphate or sulphonate, in the first case and

an ethylene oxide condensation product in the second case. It may be present in the detergent solution in amounts of 0.01 to 0.5 per cent.

#### Example.

A preferred detergent solution according to the invention has the following composition; the parts being by weight:—  
Ethylenediamine tetra-acetic acid 0.1 Part  
Synthetic surface active agent (27 per cent aqueous solution of water soluble phenol-ethylene-oxide condensation product. 0.1 Part

Oxalic acid 0.2 Part  
Sodium Carboxymethyl cellulose 0.01 Part  
Water to make 100 parts by weight

In employing the detergent solution of the invention for the removal of radioactive contamination from clothing, the solution is heated to 140°F or higher and the clothing is agitated in the solution for a period of at least ten minutes, a prolonged immersion being beneficial. The greater part of the radioactive material has been found to be removed from the clothing in this way. The clothing is treated in a centrifuge to remove the greater part of the solution and is given a wash in an alkaline soap solution at a temperature of 180°F to 190°F. This is followed by rinsing. About 97 per cent of radioactive substances have been caused to pass into the solution in this way.

In the present specification parts and percentages are by weight.

What we claim is:

1. A detergent solution, suitable for removing radioactive contamination from objects and materials, comprising a synthetic surface active agent, a small amount of ethylenediamine tetra-acetic acid and another polycarboxylic acid in aqueous solution.

2. A detergent solution according to claim 1 comprising small amounts of a synthetic surface active agent, ethylenediamine tetra-acetic acid and another polycarboxylic acid,

the latter compound being in amount sufficient to give a pH of from 1.0 to 2.8 in the solution.

3. A detergent solution according to claim 1 or 2 wherein the amount of ethylenediamine tetra-acetic acid is substantially 0.1 per cent and the polycarboxylic acid is in amount from 0.2 to 0.5 per cent of the solution.

4. A detergent solution according to claim 1, 2 or 3 wherein a small amount of sodium carboxymethyl cellulose is included in the solution.

5. A detergent solution according to any preceding claim wherein the synthetic surface active agent is an alkylsulphate or sulphonate, or an ethylene oxide condensation product.

6. A detergent solution according to claim 5 wherein the synthetic surface active agent

is present in amount from 0.01 to 0.5 per cent.

7. A composition for preparing a detergent solution according to any of the claims 1 to 6 which comprises a synthetic surface active agent, ethylenediamine tetra-acetic acid and another polycarboxylic acid, the latter two compounds being present in the ratio of one part of the former to from two to five of the latter and being such that on solution or dilution of the composition to form a detergent solution containing substantially 0.1 per cent of ethylenediamine tetra-acetic acid will give rise to a pH of from 1.0 to 2.8.

8. A detergent solution or composition substantially as described.

F. FOXTON.

Chartered Patent Agent.

#### PROVISIONAL SPECIFICATION

### Improvements in or relating to Detergent Compositions Effective in Removing Radioactive Contamination

We, UNITED KINGDOM ATOMIC ENERGY AUTHORITY of London, a British Authority, do hereby declare this invention to be described in the following statement:—

This invention relates to detergent compositions and has for object to provide a composition which is effective in removing radioactive contamination from objects and materials.

According to the invention a detergent solution comprises a synthetic surface active agent, a small amount of ethylenediamine tetra-acetic acid, and a polycarboxylic acid in aqueous solution.

Preferred amounts of ethylenediamine tetra acetic acid and the polycarboxylic acid are 0.1 per cent and 0.2 to 0.5 per cent respectively, the amount of the latter compound being such as to result in a pH of 2.0 to 2.8 in the solution. The addition of a small amount of sodium carboxymethyl cellulose has been found beneficial. The preferred polycarboxylic acid is oxalic acid which is readily removed from the effluent. Other acids which may be used are citric acid and tartaric acid.

Also in accordance with the invention a composition for preparing a detergent solution comprises a synthetic surface active agent, ethylenediamine tetra acetic acid and a polycarboxylic acid, the latter two compounds being preferably present in the ratio of one part of the former to from two to five of the latter, and being such that on solution or dilution of the composition with water to form a detergent solution containing substantially 0.1 per cent of ethylenediamine tetra-acetic acid will give rise to a pH of from 2.0 to 2.8.

The synthetic surface active agent may be anionic, or non-ionic for example an alkyl sulphate or sulphonate, in the first case and an ethylene oxide condensation product in the second case. It may be present in the detergent solution in amounts of 0.01 to 0.5 per cent.

#### Example

A preferred detergent solution according to the invention has the following composition; the parts being by weight:—

Ethylenediamine tetra-acetic acid	0.1 Part
Synthetic surface active agent (27 per cent solution of an ethylene oxide condensation product.	0.1 Part
Oxalic acid	0.2 Part
Sodium Carboxymethyl cellulose	0.01 Part
Water to make 100 parts by weight	

In employing the detergent solution of the invention for the removal of radioactive contamination from clothing, the solution is heated to 140°F or higher and the clothing is agitated in the solution for a period of at least ten minutes, a prolonged immersion being beneficial. The greater part of the radioactive material has been found to be removed from the clothing in this way. The clothing is treated in a centrifuge to remove the greater part of the solution and is given a wash in an alkaline soap solution at a temperature of 180°F to 190°F. This is followed by rinsing. About 97 per cent of  $\alpha$ -particle-emitting substances have been caused to pass into the solution in this way. The alkaline soap solution may be at pH 10 to 11 and may contain sodium meta silicate and ordinary soap.

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